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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

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Signature: Lisa L. Vulpis Date: May 16, 2005

Applicant(s): Lior Shabtay
Case: 500001-A-01-US (Shabtay)
Serial No.: 09/718,143
Filing Date: November 21, 2000
Group: 2153
Examiner: Aaron N. Strange

Title: Dynamic Load Balancer

TRANSMITTAL OF APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Submitted herewith are the following documents relating to the above-identified patent application:

(1) Appeal Brief; and
(2) Copy of Notice of Appeal, filed on March 16, 2005, with copy of stamped return postcard indicating receipt of Notice by PTO on March 18, 2005.

There is an additional fee of $500 due in conjunction with this submission under 37 CFR §1.17(c). Please charge **Avaya Inc. Deposit Account No. 50-1602** the amount of $500, to cover this fee. In the event of non-payment or improper payment of a required fee, the Commissioner is authorized to charge or to credit **Deposit Account No. 50-1602** as required to correct the error. A duplicate copy of this letter is enclosed.

Respectfully submitted,

Joseph B. Ryan

Date: May 16, 2005

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Signature: Lisa L. Vulpis Date: May 16, 2005

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313

Sir:

Applicant (hereinafter referred to as "Appellant") hereby appeals the final rejection of claims 1-7, 11-24 and 28-41 of the above-referenced application.

REAL PARTY IN INTEREST

The present application is assigned to Avaya Inc. or a subsidiary thereof. Avaya Inc. is the real party in interest.

RELATED APPEALS AND INTERFERENCES

There are no known related appeals and interferences.

STATUS OF CLAIMS

Claims 1-41 are currently pending in the application. Claims 1, 13, 28 and 37 are the independent claims. Claims 1-7, 11-24 and 28-41 stand rejected variously under §§112, 102(b) and 103(a). The Examiner indicates that claims 8-10 and 25-27 would be allowable if rewritten in independent form. The rejections of claims 1-7, 11-24 and 28-41 are appealed.

STATUS OF AMENDMENTS

Amendments to claims 3, 6 and 9 were filed after final rejection pursuant to 37 C.F.R. §1.116(b)(1). More specifically, claims 3 and 9 were amended to address typographical errors while claim 6 was amended to correct a rejection under 35 U.S.C. §112. In addition, independent claims 1, 13, 28 and 37 were amended after final rejection pursuant to 37 C.F.R. §1.116(b)(2) to place the claims in better condition for consideration on appeal.

In the Advisory Action dated April 7, 2005, the amendments of claims 3, 6 and 9 are not addressed even though, in each case, Appellant's amendments complied with the Examiner's recommendations (see Final Office Action, pp. 2 and 5). The Examiner expressly rejects the amendments of independent claims 1, 13, 28 and 37 because "they fail to place the application in condition for allowance and raise new issues that would require further consideration and/or search" (Advisory Action, p. 2).

With respect to the amendments of independent claims 1, 13, 28 and 37, Appellant added additional limitations to these claims in order to remove issues of contention that arose during the examination and to reduce the issues for consideration on appeal. More specifically, Appellant attempted to amend each claim to include the limitation that the load balancer and accelerator switch elements are separate and discrete from one another. Nonetheless, in rejecting these amendments, the Examiner states that these new limitations have not previously been considered. Appellant respectfully disagrees. The separation of the load balancer element from the accelerator switch element was argued by Appellant in its responses to both the First and Second Office Actions (see, e.g., Response to First Office Action, p. 10, 2nd paragraph). These arguments were acknowledged by the Examiner in the Final Office Action as "features upon which appellant relies" (see, e.g., Final

Office Action, p. 3, #6). Therefore, Appellant believes that these amendments relate to issues that were considered by the Examiner in the course of the First and Second Office Actions and should have been entered under 37 C.F.R. §1.116(b)(2).

SUMMARY OF CLAIMED SUBJECT MATTER

The present invention, in an illustrative embodiment, provides a load balancing accelerator for load balancers which perform half NAT (Network Address Translation) and/or full NAT forwarding (Specification, p. 2, lines 19-21). In half NAT mode, load balancers change the destination IP address and/or port of packets which they forward to servers. In full NAT mode, load balancers change both the source and destination IP addresses of packets which they forward to the servers (Specification, p. 2, lines 5-12)

In accordance with an aspect of the invention, a method of accelerating the operation of a load balancer by an acceleration switch comprises: i) receiving, by the accelerator switch, packets directed to the load balancer, the load balancer being configured to operate in a first mode and a second mode, wherein the load balancer operating in the first mode changes at least one of a destination IP address and a destination port of one or more packets it forwards and the load balancer operating in the second mode changes at least a source IP address and a destination IP address of one or more packets it forwards; ii) determining, for at least one of the received packets, whether the packets match an entry of a list of packet groups, by comparing fewer than five packet parameters that are not changed by the load balancer to respective fields of entries of the list; and iii) forwarding, by the accelerator switch, at least one of the received packets, directly to its destination, responsive to the determining.

In accordance with another aspect of the invention, method of creating an entry in a list which correlates between packet groups and respective destination servers, comprises: i) receiving, by an accelerator, a packet directed from or to a load balancer, the load balancer being configured to operate in a first mode and a second mode, wherein the load balancer operating in the first mode changes at least one of a destination IP address and a destination port of one or more packets it forwards and the load balancer operating in the second mode changes at least a source IP address and

a destination IP address of one or more packets it forwards; and ii) creating, by the accelerator, an entry comprising parameters not changed by the load balancer in the list of destination servers, responsive to the received packet.

In accordance with yet another aspect of the invention, a load balancing accelerator, comprises: i) an input interface which receives packets directed to a load balancer; ii) a table which lists packet groups and their respective destination servers, the table having physical entries which can accommodate different field sets for storage of data entries; iii) a comparator which compares at least one of the packets directed to the load balancer to one or more of the data entries of the table; iv) a forwarding unit which forwards at least one of the packets for which a match was found by the comparator, directly to a server, responsive to the contents of the matching data entry; and v) a controller which determines in which field set, from the plurality of different field sets, each of the data entries of the table is stored.

In accordance with yet another aspect of the invention, a load balancing accelerator, comprises: i) an input interface which receives packets directed to a load balancer; ii) a table which lists packet groups and their respective destination servers, the table having physical entries which can accommodate different field sets for storage of data entries; iii) a comparator which compares at least one of the packets directed to the load balancer to one or more of the data entries of the table; iv) a forwarding unit which forwards at least one of the packets for which a match was found by the comparator, directly to a server, responsive to the contents of the matching data entry; and v) a controller which determines in which field set, from the plurality of different field sets, each of the data entries of the table is stored.

FIGS. 1 and 8 show schematic block diagrams of server farms with one and two load balancers, respectively, in accordance with different embodiments of this invention. FIGS. 2 and 4 show exemplary load balancing tables. Finally, FIGS. 3, 5 and 7 show flow charts of the acts performed by an accelerator upon receiving a packet in accordance with different embodiments of this invention.

Many advantages flow from the teachings of the present invention. The prior art generally uses a set of five parameters which identify communication sessions in differentiating between

different groups based on the general practice that load balancers relate the same way to packets belonging to a single session. Many load balancers, however, relate the same way to larger groups defined by sets of parameters including fewer than five parameters. By using these smaller sets of parameters in grouping the packets, the operation of the accelerator is simplified (e.g., a load balancing table of the accelerator is kept small), without violating load balancing rules of the accelerated load balancer. In addition, in some cases it is possible to identify communication sessions based on different sets of parameters, as some of the parameters in the set may be superfluous in a specific context. Using fewer parameters simplifies the operation of the load-balancing accelerator and reduces the amount of storage space required (Specification p. 2, line 28 - p. 3, line 6).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

(i) Claim 6 is rejected under 35 U.S.C. §112, 2nd paragraph.

(ii) Claims 28, 32, 37 and 38 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,774,660 to Brendel et al. (hereinafter "Brendel").

(iii) Claims 1-5, 7, 11-17, 19 and 23 are rejected under 35 U.S.C. §103(a) as being unpatentable over Brendel in view of U.S. Patent No. 6,098,093 to Bayeh et al. (hereinafter "Bayeh") in further view of allegedly admitted prior art.

(iv) Claims 18, 20-22 and 24 are rejected under 35 U.S.C. §103(a) as being unpatentable over Brendel in view of Bayeh in further view of Cisco Systems, *Catalyst 6000 Family Accelerated Server Load Balancing*, http://www.cisco.com/warp/public/cc/pd/si/casi/ca6000/tech/aslb_wp.htm (hereinafter "Cisco").

(v) Claim 6 is rejected under 35 U.S.C. §103(a) as being unpatentable over Brendel in view of P. Srisuresh et al., *RFC2391: Load Sharing using IP Network Address Translation (LSNAT)*, August 1998 (hereinafter "Srisuresh").

(vi) Claims 29-31, 33-36 and 39-41 are rejected under 35 U.S.C. §103(a) as being unpatentable over Brendel.

ARGUMENT

Appellant incorporates by reference herein the disclosures of all previous responses filed in the present application, namely, responses dated August 30, 2004 and March 16, 2005.

(i) Rejection under 35 U.S.C. §112, 2nd paragraph

Claim 6

In the Final Office Action on p. 5, the Examiner recommends that claim 6 be amended to specify that the load balancer element is operating in the first mode. Appellant agrees and, therefore, filed the corresponding amendment after final rejection pursuant to 35 C.F.R. §1.116(b). Nonetheless, the Examiner failed to enter this amendment. The §112 rejection of claim 6 therefore remains at issue on appeal.

(ii) Rejection under 35 U.S.C. §102(b) over Brendel

Claims 28, 32, 37 and 38

With respect to the §102(b) rejections, Appellant initially notes that the Manual of Patent Examining Procedure (MPEP), Eighth Edition, August 2001, §2131, specifies that a given claim is anticipated "only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference," citing Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Moreover, MPEP §2131 indicates that the cited reference must show the "identical invention . . . in as complete detail as is contained in the . . . claim," citing Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Each of the independent claims 28 and 37 describes a combination which comprises both a load balancer and a discrete load balancing accelerator (or "accelerator"). The fact that the load balancer element and the accelerator element are separate from one another is clear from the construction of the claims, the specification and the figures. With respect to the claims, for example, claims 28 and 37 both describe "[a] load balancing accelerator, comprising: an input interface which receives packets directed to a load balancer." It would clearly be illogical to introduce "a load

balancer" element in this manner if the load balancer were not a discrete element from the load balancing accelerator. Similarly, the specification also defines an accelerator as a separate element from a load balancer. According to the specification, a load balancer may receive packets directed to a web site and distributes the packets between the plurality of servers. See the specification, p. 1, lines 5-10. An accelerator, on the other hand, learns how to distribute packets based on the behavior of the load balancer and forwards subsequent packets from a client to the load balancer directly to the servers. See the specification, p. 1, line 16 to p. 2, line 3. An accelerator may function in part, thereby, to advantageously reduce the load on the associated load balancer. Finally, FIGS. 1 and 8 show a load balancer and accelerator elements as separate from one another.

In formulating the §102(b) rejection of independent claims 28 and 37, the Examiner argues that each and every element of the claims is anticipated by Brendel. However, while Brendel describes a form of load balancer, it fails to describe a discrete element corresponding to an accelerator as set forth in the claims. In fact, Brendel does not even contain the word "accelerate" or "accelerator." Because of this omission, the Examiner apparently argues that the load balancer in Brendel functions as both a load balancer and a corresponding accelerator. With this explanation, the Examiner substitutes Brendel's load balancer for the discrete accelerator element when arguing that Brendel anticipates the claims in the present invention. Appellant respectfully suggests that such a argument is untenable because Brendel fails to describe each and every element of the claims.

Moreover, a load balancer, even one with more than one state of operation, does not function like a separate accelerator acting in combination with a load balancer. One skilled in the art will recognize that the load balancer of Brendel, for instance, is not capable of doing load balancing operations and acceleration operations simultaneously. Brendel's load balancer must enter a "pass through" state in order to send subsequent packets from the browser to the assigned server. See Brendel, col. 12, lines 59-63. A discrete accelerator, on the other hand, is capable of sending packets directly to a server while the load balancer continues to load balance. See the specification, p. 1, line 16 to p. 2, line 3. Consequently, a discrete accelerator, as described in claim 28 and 37, may advantageously reduce the load on the load balancer and, thereby, decrease the need to replace or add load balancers. See the specification, p. 1, lines 11-15. Brendel's invention is devoid of such an

advantage.

In response to the last argument, the Examiner further argues:

> Brendel discloses that the "pass-through state" simply means that subsequent packets from the same client are passed through to the assigned server. Packets which have not been assigned to server are still load balanced, so the load balancer does perform both load balancing and acceleration simultaneously (Final Office Action, pp. 3-4)

Appellant respectfully disagrees and suggests that the Examiner is assuming that Brendel's accelerator can operate in more than one "state" simultaneously. Nevertheless, such an assumption is not supported by Brendel.

Dependent claims 32 and 38 are believed allowable for at least the reasons identified above with regard to their respective independent claims.

(iii) Rejection under §103(a) over Brendel in view of Bayeh

Claims 1-5, 7, 11 and 12

With respect to the §103(a) rejection, Appellant initially notes that MPEP §2143.03 states that in order "[t]o establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art," citing In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Appellant also notes that MPEP §2143.03 provides that "[i]f an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious," citing In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Like independent claims 28 and 37, claim 1 comprises both a load balancer element and a discrete accelerator element. Nonetheless, in formulating the §103(a) rejection of this claim as unpatentable over Brendel in view of Bayeh, the Examiner again relies on Brendel to teach or suggest both elements. Appellant once more submits, as described above with respect to the §102(b) rejection of claims 28 and 27, that Brendel fails to teach or suggest such a system or method, and that Bayeh fails to correct this fundamental deficiency. Appellant, therefore, respectfully submits that claim 1 and its dependent claims 2-7, 11 and 12 would not have been obvious at the time the

invention was made and that these claims should be allowed.

Claims 13-17, 19 and 23

With regard to the§103(a) rejection of independent claim 13 as unpatentable over Brendel in view of Bayeh, Appellant notes that the Examiner again relies on Brendel to teach or suggest both the load balancer element and discrete accelerator element present in rejected claim (Final Office Action, p. 12). As before, Appellant submits that Brendel fails to teach or suggest such a system or method, and that Bayeh fails to correct this fundamental deficiency.

Moreover, claim 13 includes the step of "creating, by the accelerator, an entry comprising parameters not changed by the load balancer in the list of destination servers, responsive to the received packet." While the Examiner acknowledges on p. 13 of the Final Office Action that Brendel fails to specifically disclose that this entry comprises parameters not changed by the load balancer, the Examiner, subsequently, fails to argue that Bayeh does in fact teach this limitation. Appellant respectfully asserts that Bayeh teaches no such limitation. Therefore Brendel contains another fundamental deficiency which Bayeh fails to remedy with respect to claim 13..

Appellant, therefore, respectfully submits that claim 13 and its dependent claims 14-17, 19 and 23 would not have been obvious at the time the invention was made and that these claims should be allowed.

(iv) Rejection under 35 U.S.C. §103(a) over Brendel in view of Bayeh in further view of Cisco

Claims 18, 20-22 and 24

Appellant respectfully asserts that the Brendel and Bayeh combination fails to teach or suggest all the limitations of independent claim 13, as described in the previous section, and that Cisco fails to remedy this fundamental deficiency. Therefore dependent claims 18, 20-22 and 24 would not have been obvious at the time the invention was made and these claims should be allowed.

(v) Rejetion under 35 U.S.C. §103(a) over Brendel in view of Srisuresh

Claim 6

Appellant respectfully asserts that Brendel fails to teach or suggest all the limitations of independent claim 1, as described above in section (iii), and that Srisuresh fails to remedy this fundamental deficiency. Therefore, dependent claim 6 would not have been obvious at the time the invention was made and this claim should be allowed.

(vi) Rejection under 35 U.S.C. §103(a) over Brendel.

Claims 29-31, 33-36 and 39-41.

Appellant respectfully asserts that Brendel fails to teach or suggest all the limitations of independent claims 28 and 37, as described above in section (ii). Therefore, dependent claims 29-31, 33-36 and 39-41 would not have been obvious at the time the invention was made and these claims should be allowed.

For at least the reasons given above, Appellant respectfully requests withdrawal of the §112, §102(b) and §103(a) rejections.

Respectfully submitted,

Date: May 16, 2005

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CLAIMS APPENDIX

1. A method of accelerating the operation of a load balancer by an accelerator switch, comprising:

receiving, by the accelerator switch, packets directed to the load balancer, the load balancer being configured to operate in a first mode and a second mode, wherein the load balancer operating in the first mode changes at least one of a destination IP address and a destination port of one or more packets it forwards and the load balancer operating in the second mode changes at least a source IP address and a destination IP address of one or more packets it forwards;

determining, for at least one of the received packets, whether the packets match an entry of a list of packet groups, by comparing fewer than five packet parameters that are not changed by the load balancer to respective fields of entries of the list; and

forwarding, by the accelerator switch, at least one of the received packets, directly to its destination, responsive to the determining.

2. A method according to claim 1, wherein determining whether the packets match an entry of the list comprises comparing three or fewer parameters of the packets to respective fields in the list.

3. A method according to claim 2, wherein determining whether the packets match an entry of the list comprises comparing two parameters of the packets to a respective field in the list.

4. A method according to claim 2, wherein determining whether the packets match an entry of the list comprises comparing a single parameter of the packets to a respective field in the list.

5. A method according to claim 1, wherein receiving packets directed to the load balancer comprises receiving packets directed from a client to a Web site associated with the load balancer and forwarding at least one of the received packets directly to its destination comprises forwarding the packets from the clients to one of the servers of the Web site without passing through the load

balancer.

6. A method according to claim 5, wherein determining whether the packets match an entry of the list comprises comparing the source IP address and source port of the packets to respective fields in the list.

7. A method according to claim 5, wherein the compared parameters do not include a destination address.

8. A method according to claim 1, wherein receiving packets directed to the load balancer comprises receiving packets directed from a server to a client and forwarding at least one of the received packets directly to its destination comprises forwarding the packets from the server to the client without passing through the load balancer.

9. A method according to claim 8, wherein determining whether the packets match an entry of the list comprises comparing the destination port of the packets to respective fields in the list.

10. A method according to claim 8, wherein the compared parameters do not include a source address.

11. A method according to claim 1, wherein forwarding at least one of the received packets comprises forwarding packets for which a matching entry was found.

12. A method according to claim1, wherein the load balancer operates in half NAT or full NAT mode.

13. A method of creating an entry in a list which correlates between packet groups and respective destination servers, comprising:

receiving, by an accelerator, a packet directed from or to a load balancer, the load balancer being configured to operate in a first mode and a second mode, wherein the load balancer operating in the first mode changes at least one of a destination IP address and a destination port of one or more packets it forwards and the load balancer operating in the second mode changes at least a source IP address and a destination IP address of one or more packets it forwards; and

creating, by the accelerator, an entry comprising parameters not changed by the load balancer in the list of destination servers, responsive to the received packet.

14. A method according to claim 13, wherein creating the entry comprises creating an entry which does not include a destination address of a Web site.

15. A method according to claim 13, wherein the packet is directed from or to a load balancer operating in a half NAT mode.

16. A method according to claim 13, wherein the packet is directed from or to a load balancer operating in a full NAT mode.

17. A method according to claim 13, wherein receiving the packet comprises receiving a packet directed from the load balancer to a server.

18. A method according to claim 13, wherein receiving the packet comprises receiving a packet directed from a server to the load balancer.

19. A method according to claim 13, wherein creating the entry comprises creating the entry using only information in the received packet as it was received.

20. A method according to claim 13, wherein creating the entry comprises creating the entry using information not included in the received packet as it was received.

21. A method according to claim 20, wherein creating the entry comprises creating the entry using information from a copy of the received packet, previously received by the accelerator.

22. A method according to claim 21, wherein receiving the packet comprises receiving a packet from the load balancer and creating the entry comprises creating the entry using information from the received packet and from a copy of the received packet forwarded to the load balancer.

23. A method according to claim 13, further comprising receiving, by the accelerator, a packet directed from or to an additional load balancer and creating, by the accelerator, an entry in the list of destination servers, responsive to the packet directed from or to the additional load balancer.

24. A method according to claim 13, further comprising:

receiving, by the accelerator, packets directed to a Web site handled by the load balancer;

storing identification information and values of one or more parameters of the packets directed to the Web site, in a temporary storage; and

searching the temporary storage for an entry which matches a packet directed from the load balancer,

wherein creating the entry in the list of destination servers of packet groups is performed only if a match is found.

25. A method according to claim 24, wherein storing the identification information comprises storing a unique identification number tagged to the packet by the accelerator.

26. A method according to claim 24, wherein storing the identification information comprises storing at least one of the sequence and acknowledge fields of TCP packets.

27. A method according to claim 26, wherein storing the identification information comprises

storing a leading segment of the payload of the packet.

28. A load balancing accelerator, comprising:

an input interface which receives packets directed to a load balancer;

a table which lists packet groups and their respective destination servers, the table having physical entries which can accommodate different field sets for storage of data entries;

a comparator which compares at least one of the packets directed to the load balancer to one or more of the data entries of the table;

a forwarding unit which forwards at least one of the packets for which a match was found by the comparator, directly to a server, responsive to the contents of the matching data entry; and

a controller which determines in which field set, from the plurality of different field sets, each of the data entries of the table is stored.

29. An accelerator according to claim 28, wherein the controller comprises a user interface through which a user may configure the field sets in which the data entries of the table are stored.

30. An accelerator according to claim 28, wherein the controller automatically determines the field sets in which the data entries are stored.

31. An accelerator according to claim 30, wherein the controller transmits one or more packets to the load balancer and examines the response of the load balancer to determine the field sets in which the data entries are stored.

32. An accelerator according to claim 28, wherein the controller determines the field sets in which the data entries of the table are stored, such that at a single time all the data entries of the table are stored in the same field sets.

33. An accelerator according to claim 28, wherein the controller determines the field sets in

which the data entries of the table are stored, such that at least during some periods of operation of the accelerator, the table includes at least two data entries stored in different field sets.

34. An accelerator according to claim 28, wherein at least one of the physical entries of the table can be configured for use with different field sets.

35. An accelerator according to claim 28, wherein the table comprises a plurality of sub-tables with physical entries having different field sets.

36. An accelerator according to claim 28, wherein the input interface receives packets directed to a plurality of load balancers and wherein the data entries corresponding to a first load balancer are stored in a first set of fields and data entries corresponding to a second load balancer are stored in a second set of fields different from the first set of fields.

37. A load balancing accelerator, comprising:

an input interface which receives packets directed to a load balancer;

a table which lists packet groups and their respective destination servers;

a comparator which compares at least one of the packets directed to the load balancer to at least one of the entries of the table;

a forwarding unit which forwards directly to a server, at least one of the packets for which a match was found by the comparator, responsive to the contents of the matching entry, the forwarding unit being capable of operating in a plurality of operation modes, at least one of the operation modes including changing at least one of the fields of the forwarded packets; and

a controller which determines in which mode the forwarding unit operates.

38. An accelerator according to claim 37, wherein the forwarding unit is capable of performing splicing.

39. An accelerator according to claim 37, wherein the controller determines the operation mode of the forwarding unit based on a user configuration.

40. An accelerator according to claim 37, wherein the controller determines the operation mode of the forwarding unit based on the contents of packets directed from or to the load balancer.

41. An accelerator according to claim 37, wherein the controller determines the operation mode of the forwarding unit by comparing the contents of packets from the load balancer with packets directed to the load balancer.

EVIDENCE APPENDIX

None

RELATED PROCEEDINGS APPENDIX

None